on p. 306, that indirect association of ideas is "easily demonstrated," when several investigators, one recently in Prof. Wundt's own laboratory, have failed to find any evidence of such a mode of association.

The translation has been very well done, and especial care has evidently been devoted to the rendering of the German psychological terms. The translators have very freely used the term "to sense" as a verb corresponding to sensation, and as the equivalent of "empfinden." This American innovation, which has already been advocated by Dr. Titchener, is also used by Prof. Lloyd Morgan in his two books, and it must be acknowledged that there is decided need of some such term.

Dr. Külpe is chief assistant to Prof. Wundt at the Leipzig Institute, and his experience in teaching and in directing investigation must have contributed largely to make his book what it is—one of the best existing expositions of experimental psychology. The general teaching follows that of Wundt, but there is much that is novel in matter and arrangement. Physiological details and the technique of experimental methods are omitted or treated very briefly, but the principles of the methods are fully discussed. Dr. Külpe's book will probably be largely used as a text-book for advanced students.

Prof. Lloyd Morgan's two books, to a certain extent, cover the same ground. Each is an exposition of general psychological principles to serve as guides, in the one case, to the scientific study of the animal mind; in the other, to the practical study of the child's mind. Both books are characterised by the sound common sense with which the author treats his problems.

The views held on the nature of the animal mind are very similar to those of Wundt. Both agree that in studying animal psychology the scientific method is to explain actions by the simplest possible mental processes, and this method has led both to similar conclusions, although expressed in somewhat different language. Wundt refers all intelligent acts of animals to simple associations, to the exclusion of any higher apperceptive process; while Prof. Morgan explains such acts by simple sense experience, and doubts, though he does not deny, the existence of any true reasoning or reflective process. A point justly insisted on by Prof. Morgan is that observation of an apparently rational action in an animal is of little value without knowledge of the process by which the action has been developed; "in zoological psychology we have got beyond the anecdotal stage; we have reached the stage of experimental investigation."

The book for teachers is very interesting, and contains much that should be of practical value. It is noteworthy that the appreciative preface, with its ample recognition of the part that a knowledge of psychology should take in the equipment of the teacher, is written by Dr. Fitch, late one of H.M. Chief Inspectors of Training Colleges.

Prof. Ladd has attempted a very difficult task in writing a primer of psychology suited for the young. His book is often simple and clear; it is to be feared, however, that youthful readers will find much of it beyond their capacity. The author has, at any rate, avoided the fault of being too dogmatic.

OUR BOOK SHELF.

Radiant Suns. By Agnes Giberne. (London: Seeley and Co., 1895.)

IN this sequel to a former work, the reader is taken by easy stages into the domain of spectroscopic astronomy and the evolution of worlds. Though following some astronomers who ought to know better, the authoress takes the unphilosophical view that the whole process of stellar evolution is one of cooling; and this is the more difficult to understand, as she is evidently not unfamiliar with the fact that a condensing body may actually be getting hotter (p. 307). While strongly advocating the value of hypotheses as aids to investigation, she is inconsistent enough to make contemptuous reference to the "half-fledged" theories of "scientists of a lower order" (p. 240); her qualifications for making such distinctions are not very clear to us, but her opinions seem to depend to some extent on personal bias, since special prominence is given to the views and work of one observer.

A preface is contributed by Mrs. Huggins, who is careful to disclaim responsibility in matters of opinion, and laments that the masses of men overlook the fact that "the investigator, absorbed in pursuits far removed from those of ordinary life, is also a toiling worker, and a worker of the highest order."

The illustrations are admirable and quite up to date. It would be worth while, however, to revise the coloured plate of stellar spectra, so that the spectrum of Vega would not be robbed of its strongest characteristic—the lines of hydrogen.

We believe that the book will succeed in awakening a desire for further knowledge in the minds of thoughtful readers; and if so, it will serve a useful purpose.

Album von Papúa-Typen. Von A. B. Meyer and R. Parkinson. (Dresden: Stengel und Markert, 1894.)

TO ethnologists, the Papuan race is one of the most interesting in the world. Whether the Papuan represents a distinct type of mankind or not is doubted by some observers, though the balance of evidence is in favour of that conclusion. This splendid collection of fifty-four plates reproduced from photographs, and representing about six hundred portraits of individuals, should be of great assistance in studying the similarities and differences between the typical Papuan, and the natives of southern and eastern New Guinea. The photographs illustrate the natives of New Britain, the Duke of York Islands, New Ireland, Admiralty Islands, Solomon Islands, German New Guinea, and Dutch New Guinea. They represent the people as they are ordinarily seen, and also decorated with the strange costumes assumed at feasts. Particularly striking are the pictures of natives of New Britain adorned for one of their Dukduk dances, and of the ingenious basket-work traps used by the fishermen. Ethnology will benefit by the publication of this collection of really excellent pictures.

Farm Vermin, Helpful and Harmful. By various Writers. Edited by John Watson, F.L.S. Pp. 85. (London: William Rider and Son, Limited, 1894.)

COMPOSITE books are almost always unsatisfactory, the chapters by the various contributors being necessarily unequal in quality and length. We really cannot understand why this little book of eighty pages should not have been written by a single zoologist, instead of the eight who have helped to construct it. The only justification for the patch-work is that each of the writers is more or less an authority upon the subject he describes; but the book is of such an elementary

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character, that it is difficult to believe that so many minds are necessary for its construction. The contributors are Sir Herbert Maxwell, Mr. O. V. Alpin, Mr. John Cordeaux, Mr. Cecil Warburton, Dr. J. Nisbet, and Mr. C. B. Whitehead. Each tells his tale in his own way, and the editor amplifies the information here and there by means of foot-notes. Farmers will find the book a handy and simple guide, and one which will enable them to know their friends and enemies among the "varmints."

LETTERS TO THE EDITOR.

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The New Cypress of Nyasaland.

THE interesting account of *Widdringtonia whytei* (NATURE, November 22, pp. 85-87) discovered by Mr. Whyte on the Milanji plateau, suggests a few brief comments.

(1) It is said to extend "the geographical range of the genus hitherto known only from South Africa, Madagascar, and Mauritius into tropical Africa." As far as the latter statement is concerned, this is no doubt true. But the existence of any species of the genus in Madagascar or Mauritius seems to be wanting in sufficient evidence, though repeatedly cited by authorities. Thus Madagascar is given in the geographical distribution for the aggregate genus *Callitris* in Bentham and Hooker, "*Genera Plantarum*," vol. iii. p. 424; Dr. Masters, *Journ. Linn. Soc. Bot.* vol. xxx p. 17, says "one (*Widdringtonia*) has been discovered in Madagascar"; Mr. Rendle, *Trans. Linn. Soc.* (2nd series) *Bot.* vol. iv. p. 61, speaks of the "South African and Mascarene *Widdringtonia*."

All these statements are based on a species, *Widdringtonia Commersonii*, which was *cultivated* at Réduit, Mauritius, and of which the native country was assumed to be Madagascar, though this has never been confirmed.

In 1806, it is referred to in the "Nouveau Duhamel," vol. iii. p. 10, as *Thuya quadrangularis*, with the following remark: "Habite l'isle de Madagascar; depuis quelques années ou le cultive au réduit, jardin de botanique a l'Isle de France."

The Madagascar habitat was apparently purely conjectural. And though the island has of late years been pretty assiduously worked by French, German, and English botanical collectors, no conifer has been detected in it except *Podocarpus*.

In 1833 the development of the myth went a step further. Brongniart cites the species in the *Ann. des Sc. Nat.*, series 1, vol. xxx. p. 190, under the name of *Pachylepis Commersonii*, with the remark: "Hab. in Insula Mauritii in loco dicto Le Réduit (Commerson, 1769)."

Thus it will be seen that, starting as an introduced Madagascar species cultivated in a botanic garden in Mauritius, it finishes with being treated as an undoubted native of that island.

It is, however, to be noted that from "Baker's Flora of Mauritius and the Seychelles" (1877) the *Coniferæ* appear to be entirely absent from the Mascarene Islands.

(2) There is nothing improbable in a *Widdringtonia* occurring in Madagascar. But none has yet been detected with any certainty. It seems not improbable that Commerson's plant was really derived from South Africa. This would seem to be the conclusion at which Carrière arrived in 1867, "Conifères," ed. ii. p. 67:—"Cette prétendue espèce me parait être à peine une forme de la précédente." (*W. cupressoides*, one of the two South African species).

(3) The *Coniferæ* for the most part can hardly be regarded as other than a very ancient and a decaying group. Their existing distribution is therefore peculiarly interesting. Bentham and Hooker unite under *Callitris* a number of small genera which practically only differ in the number of their ovule-bearing scales and in their geographical distribution. They divide the genus so reconstituted into four sections, of which two are broadly Australian, two are African. Other instances of parallelism between the Australian and African floras are well known and are full of interest. Of the African sections one is confined to the north, with one species, *Callitris quadrivalvis*, which yields the gum Sandarach of modern commerce, and produced the Thyine wood once so prized by the Romans; the other section, with two species, is confined to the south. The occurrence of a third species on the Milanji highlands is entirely in harmony with what we know of the distribution of plants in Tropical Africa. As has been shown now in numerous cases, a temperate and possibly more ancient flora more or less overlies at elevations where it can exist, the lower lying tropical one, and it forms a series of broken links by which the connection of the temperate flora of Europe and of the Mediterranean basin with that of South Africa, and even of the Madagascar uplands, are at least indicated.

It may be remarked that another coniferous genus, *Podocarpus*, behaves much in the same same way as *Callitris*. Four of the five African species occur at the Cape, and two on Kilima-n'jaro. *Juniperus*, on the other hand, though well represented in Northern Africa, occurs in Abyssinia and the Masai country, but yet does not reach South Africa.

W. T. THISELTON-DYER.

Royal Gardens, Kew, December 10.

The Kinetic Theory of Gases.

I SHOULD like to ask Mr. Culverwell what are the "other considerations" from which we know that in a system of elastic spheres the error law gives the only permanent state.

I will endeavour to extend the proof of the H-theorem which I gave for elastic spheres to a more general, but not the most general, case.

The coordinates of a molecule are x, y, z, defining its position in space, and $q_1 \ldots q_{n-3}$, the momenta are $p_1 \ldots p_n$; and different values of the same variables shall be denoted by PQ and, as the case may require, by accented letters $p'\mathrm{P}'$, &c. The number per unit volume of molecules, for which the variables p and q are between assigned limits, is $f\,dq\,dp$, and f is a function of the p's and q's independent of $x\,y\,z$.

The number of pairs for which one molecule has variables $\mathrm{P}'\mathrm{Q}'$ between assigned limits, *i.e.* is in the state $\mathrm{P}'\mathrm{Q}'$, and the other $p'q'$ between assigned limits, *i.e.* is in the state $p'q'$, is $\mathrm{F}'f'a\mathrm{P}'d\mathrm{Q}'dp'dq'$.

Each molecule has a centre of gravity. It is possible to describe a sphere about that point as centre, such that if the centre of gravity of another molecule be on or beyond that sphere, no appreciable force is exerted between the two molecules. Let a be the least radius of such a sphere. Then when the centre of one molecule is on the sphere of radius a described round the centre of another, an encounter begins or ends between the two molecules.

Now suppose an encounter to take place between a pair of molecules one of which is in the state $\mathrm{P}'\mathrm{Q}'$, and the other in the state $p'q'$. As the result of the encounter the variables $\mathrm{P}' \ldots q'$ assume new values, but what particular values they shall assume, given $\mathrm{P}'\mathrm{Q}'p'q'$ before encounter, depends on the two coordinates $\theta'\phi'$ defining the position of the centre of one of the two molecules on the "a" sphere described about the centre of the other at the commencement of the encounter.

Inasmuch as no work is done in moving the centre of one molecule on the surface of this sphere, it is evident that the "sorting demons" can make the result of the encounter anything that they please, *conservatis conservandis*.

Let us suppose that if these spherical coordinates lie between the limits θ' and $\theta' + d\theta'$, ϕ' and $\phi' + d\phi'$, the variables will after encounter lie between the limits $\mathrm{P} \ldots \mathrm{P} + d\mathrm{P}$, &c., that is, the pair will be in the state $\mathrm{P}q$, and $\theta'\phi'$ will have become $\theta \ldots \theta + d\theta$ and $\phi \ldots \phi + d\phi$.

I will now assume (condition A) that the coordinates $\theta'\phi'$ are taken at haphazard without regard to the variables $\mathrm{P}'q'$; if that be so, the chance that, for given $\mathrm{P}'q'$ before encounter, the pair of molecules shall be in the $\mathrm{P}q\theta\phi$ state after encounter is $\frac{d\theta'd\phi'}{4\pi}$.

But the number of pairs which now are in the state $\mathrm{P}'q'$ is

$$\mathrm{F}'f'd\mathrm{P}' \ldots dq'$$

And therefore the number which after encounter will be in the state $\mathrm{P}q\theta\phi$, having passed thereto from the state $\mathrm{P}'q'$, will be

$$\mathrm{F}'f'd\mathrm{P}'d\mathrm{Q}'dp'dq'\frac{d\theta'd\phi'}{4\pi},$$

which is equal to

$$\frac{1}{4\pi}d\mathrm{P}d\mathrm{Q}dpdqd\theta d\phi\,.\,\mathrm{F}'f'.$$

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